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DEDICATION OF THE CHEMISTRY BUILDING OF THE COLLEGE OF THE CITY OF NEW YORK, MAY 14, 1908

IN taking the chair, Professor Baskerville, the director of the laboratory, said:—

Ladies and Gentlemen:

In the name of the honorable board of trustees, the president and the staff of the department of chemistry, I bid you hearty welcome. We are here to-day, because

First, honor is to be done to two teachers of chemistry, each distinguished in his own way as a scientist and as a citizen; and

Second, a building is to be formally opened and set aside for the study of chemistry.

It is not appropriate on this occasion to dwell upon the multitude of details incorporated in plans for a laboratory constructed to accommodate more than a thousand students. My colleagues hold themselves in readiness to show those particularly interested over the unfinished building at the close of these exercises. Papers have appeared and others will soon appear in print which call attention to the principles involved and some of the incidental details. The building is not perfect. No structure devised by the human mind or constructed by the human hand is ever perfect. Many ideas have been borrowed from other laboratories in this country and Europe. Some have been incorporated which are original. Some are good, and others not so good.

More important than all these facilities, however, is the spirit which dominates the

teachers and students alike. I assure you, your presence to-day inspires us and its effect will be most lasting.

In the lecture theater of the department of chemistry in the University of Pennsylvania, where a laboratory was first opened to students in this country, is a frieze. Inscribed upon that border are these names: Priestley, Scheele, Lavoisier, Dalton, Gay-Lussac, Avogadro, Berzelius, Wöhler, Liebig, Graham, Bunsen, Hoffman, Cannizzaro and Wolcott Gibbs.

These names were placed by Dr. Edgar F. Smith, the present professor of chemistry. Electro-analysis is the most modern and the neatest means for analysis. Wolcott Gibbs was the father of electro-chemistry and Edgar F. Smith is now the world's authority on that subject. It is a great happiness to me, personally, that my dear friend Edgar F. Smith, is here today, a pioneer to speak of a pioneer, for it is his spirit I would establish in this department. I have the honor of presenting Vice-Provost Smith, who will speak to us of

A PIONEER OF CHEMISTRY

I am glad to be here on this red-letter day in the history of the College of the City of New York. I am sure that the hearts of all persons intimately connected with the college are at this moment overflowing with gladness and deepest gratitude on the completion of this splendid laboratory, which, in equipment and appointments for every kind of chemical work and investigation, stands in the first rank of laboratories designed for similar purposes.

In appearing before this happy and joyous company, it is my portion first of all, as well as my great pleasure, to offer you, President Finley and the honorable board of trustees, as well as your faculty and especially those members of it whose business it is to be in closest contact with the teaching and experimentation now being done here and which, as the years go by, shall continue to be done here—the heartiest, warmest congratulations and best wishes of the University of Pennsylvania—first of our American institutions to create a chair devoted to the science of chemistry, first also to open to its students a laboratory for practical instruction in that science.

Permit me also to extend my felicitations to the student body upon the extremely liberal and generous provisions made for them to acquire and perfect themselves in the methods of a science which has done so much for the comfort, happiness and welfare of mankind.

We see, surrounding us on all sides, innumerable evidences of a tender and deep-seated interest in those who shall come here to equip themselves for the great struggle of life. How grateful then all should be to that nation, that state or that city which has provided so munificently of its means that we may profit thereby. Indeed, it seems to me that it should create in us a great overwhelming national or civic pride—yes, more—a burning patriotism that will ever be uplifting, constructive in every respect.

However, I am not come here to read a dissertation. Not at all. I have come here to spend a few short hours with you, and to behold with my own eyes how supremely happy your beloved professor and my friend, Dr. Baskerville, is at this moment in the realization of his dream of many long years. This is his laboratory! And that reminds me that as professor of chemistry he is the successor of a brilliant line of chemists whose names shed lasting glory upon the college, and if you will bear with me, I should like to trace for a few minutes the activities of your first professor of chemistry—Wolcott Gibbs, who still lives, at the advanced age

of eighty-six years, and who, though absent in body, must surely at this moment be present with us in spirit.

When we pause to read the record of his life, or his activities in the cause of chemistry here in America, we stand entranced, as it were, and freely admit that it is worthy of the highest praise and the most careful, thoughtful consideration, for there is scarcely a contribution that has emanated from his hand which does not fairly teem with suggestive thoughts.

As a junior in Columbia College when but nineteen years of age, Wolcott Gibbs gave to the scientific public a new form of voltaic battery in which, for the first time, carbon was used as the negative electrode. In his dissertation of 1845, upon a natural system of chemical classification, there is evinced a power of discrimination and understanding of analogies in crystalline form in relations of combinations and types of compounds that betrays the superb order of chemical intellect.

Beginning here in your laboratory with the analysis of the dust of a sirocco, there followed at a close interval a series of contributions upon analytical chemistry which demonstrated his acumen in devising new methods for the determination of various metals as well as separating them with the finest accuracy when associated in complicated mixtures. Though simple, it was Wolcott Gibbs who showed how simple lead dioxide might be or was in the separation of manganese from a series of allied metals, and cerium from its almost constant associates, lanthanum and the two didymiums.

This early attention to things analytical no doubt paved the way for later contributions upon the use of sodium thiosulphate as a reagent of separation; of hypophosphorous acid as a quantitative precipitant of copper, and of others too numerous to mention.

And then in 1857, in conjunction with my own chief and honored predecessor, Dr. Genth, there appeared the first of a series of contributions upon the cobaltamines—those fascinating bodies which taxed to the utmost the analytical skill of both Gibbs and Genth. In their hands the number of these compounds in which cobalt is differently combined from what it is in its ordinary salts, was greatly multiplied; but the complete interpretation of their constitution was not given by them. The solution of that problem was reserved for Werner of Zurich. And here at least is one instance where a discovery made by Americans arrested the attention of European minds to such a degree that from following the studies of Werner we are obliged to radically modify our long-cherished views upon the doctrine of valency.

It may also be said that Gibbs remarked, "very numerous and carefully made analyses of the salts of the cobaltamines, executed in my laboratory, indicate 59 as the true atomic value of cobalt." This and other published data make certain that as early as 1858 your first professor of chemistry was wide awake to the importance of the atomic numbers and to their methods of determination—problems of deepest interest to chemists of the present time.

There is scarcely an element that Dr. Gibbs did not follow in its many combinations. He knew them all. He knew them well.

And there in your early laboratory he also carried out an exhaustive study of platinum ore, patiently reviewing the many suggestions made for the separation of the several metals of the platinum group, and then, venturing forth on his own initiative to find new and better processes, met with the most abundant success. His research made in 1860 upon

osmium bases stands to-day unfinished. Wolcott Gibbs opened the door. Who will enter and reap the rich harvest apparent there?

But it was not only in the field of analysis or in synthetic inorganic chemistry that your first professor was busy, for under date of October 27, 1857, we find him writing from the Free Academy in New York "On the Rational Constitution of Certain Organic Compounds" and concluding with this observation: "I conclude with the expression of my conviction that every complex molecule is built up, not directly of the elements which it contains, but of simpler organic molecules, which are more or less perfectly fused together but which may yet in the majority be distinctly traced in the complex whole." And then he called attention to the preparation of methyl and ethyl derivatives of silicon, as well as to the theoretic interest attaching to their vapor density determination. Though of historic value alone at this moment his study of the "Molecular Structure of Uric Acid and its Derivatives" reveals a deep appreciation of the intricacies of that great problem, the solution of which has only been made possible by such efforts as he and others put forth for its realization.

Wolcott Gibbs is the father of electroanalysis, that branch of gravimetric practise which to-day is widening its applications and winning for itself a distinct and permanent place in the great domain of analytical chemistry. But the great crowning study, perhaps, of your first professor of chemistry was that relating to complex inorganic acids—compounds in which several acid radicals unite to form a nucleus with functions like a single radical. Such derivatives have been greatly increased in number in recent years. They offer stupendous analytical problems. Their constitution is barely known. Here and there hints have been obtained as to the same. The future must disclose the methods to be pursued in unraveling their enigmatical structure, and when that is once accomplished perhaps then the constitution of the great host of silicates will also be made clear.

And now I must pause. Inadequately, superficially have I traced the activities of your first professor of chemistry. Time forbids anything more elaborate, more exhaustive. But reflect for a moment upon the cobaltamines—the amines of the platinum metals—the beginnings of electro-chemistry—the beginning and development of complex inorganic acids—and all that these represent in the way of philosophic treatment and generalization, and I think you will agree with me that it is the work of a master mind. And yet some years ago when discussing these matters with our honored and beloved Nestor of chemical research in America, he said, "I have only been a pioneer in this work, nothing more!" He has indeed been a pioneer, but better still, he inspired hosts of young men to enter these fields of inquiry and rich indeed has been their reward.

And now in conclusion let me express the wish that under the guidance and inspiration of the present occupant of the chair of chemistry, there may be trained in this palatial laboratory many young men who will pursue not only the science of chemistry, but all other sciences, in the spirit of Wolcott Gibbs, the pioneer, and like him serve well their day and generation.

The following letter from Professor Gibbs was then read:

Gibbs Avenue, Newport, R. I.,
April 6, 1908.

My dear Mr. Baskerville:

I received with pleasure your kind letter of March 28 and it gratifies me very much to have the library named after me.

I should very much like to see the new college, but at my advanced age I can not hope to be able to do so.

I recall with pleasure and interest my connections with the old institution and send heartiest good wishes to the new.

With kindest regards, I am,

Very sincerely yours,

(Signed) WOLCOTT GIBBS

Prof. Charles Baskerville.

In unveiling the portrait of Professor Wolcott Gibbs, Professor Baskerville said:

Handsome bronze doors will soon grace the main west entrance of the capitol in Washington. On one of the eight panels, four being on each side of the door, is a scene depicting science. On the sides of this panel are two figures, one of Joseph Henry, the physicist, and the other is Oliver Wolcott Gibbs, the chemist, and founder of the Union League Club of New York. There he stands, a model to all Americans, as a scientist and a citizen, and here we have his memory and likeness as a constant inspiration and a stimulus to those who follow in our footsteps.

Addressing the audience, Professor Baskerville continued:

We know from the press that there is a three days' gubernatorial picnic in progress at Washington. This is an unusual proceeding, but our distinguished president in establishing this precedent has displayed unusual common sense. This conference looking toward the conservation of our natural resources is not to become a mere speech-fest, but is intended to be really productive. To insure that, Mr. Roosevelt has commanded the presidents of the various scientific organizations of our country to be present. For that reason, and solely for that reason, we are deprived of the pleasant and happy company of Dr. Ira Remsen, of the class of 1865, president of Johns Hopkins University, and president of the National Academy of Sciences. President Remsen, however, has written of his keen regret in being absent, and has forwarded his address on "Some Changes in Chemistry in Fifty Years," which will be presented by my colleague, Professor Herbert R. Moody.

SOME CHANGES IN CHEMISTRY IN FIFTY YEARS

What changes have taken place in chemistry since this college was founded? It would be a bold and foolish man who would attempt to answer this question in fifteen minutes. As the writer does not claim to be especially bold and does not wish to be regarded as especially foolish, he will not make the attempt, but will confine himself to a few reflections of a general character, to some extent in keeping with this occasion.

First, it may be of interest to note that I had the pleasure of hearing the lectures of Professor Wolcott Gibbs in the years 1861–2. At that time there was no laboratory for students. We did not have even a text-book wherewith to cram. Once a week, as nearly as I can remember, Professor Gibbs gave us a lecture and showed us a few specimens. In another place I have recorded the interesting fact that all that I can now remember of that course of lectures is the word "sesquioxide." That stands out in bold relief. It is a great satisfaction to me to recall the fact that I had the opportunity to come in contact, though not in close contact, with Professor Gibbs at that early period. In later years we became intimate friends and have often talked over these early efforts. There were rumors then among the boys that he was a man of wide reputation. One of the older boys to whom I looked up said to me one day, "Dr. Gibbs is a remarkable man. He would be recognized as such by all the world if he would only publish his results." Well, that boy did not, of course,

know what he was talking about, but his words made an impression. Here was a man who, according to the statement quoted, was actually doing things of value to the world. Whether I learned anything from his lectures or not was a secondary matter. It was worth much to be permitted to see him and to hear him talk.

Dr. Doremus did not teach chemistry at the college in my day, but shortly afterward he gave some popular lectures on chemistry at the Cooper Institute, in the course of which he performed extremely striking experiments, many of which I can remember as clearly as if they had been performed yesterday. In fact, I have never seen more brilliant chemical lecture experiments. The hall was crowded and I am sure the lectures set many to thinking. I have always felt that my own interest in chemistry, which soon became absorbing, was due to what I saw and heard in these lectures.

With this brief reference to chemistry at the college nearly fifty years ago let me pass to chemistry as it was in the world at large at that time. We often hear the statement that chemistry has been completely revolutionized within a comparatively brief period. I have been hearing that statement ever since I have known anything about chemistry. After all, progress in chemistry has not been by revolution, but by evolution. Probably the nearest to a revolution was that which happened during the last quarter of the eighteenth century when Priestley and Scheele and Lavoisier explained the nature of combustion and paved the way to the overthrow of the theory of phlogiston which had so long controlled the views of chemists. But that theory was not overthrown in a day or in a year. Priestley and Scheele, whose discovery of oxygen led to Lavoisier's work on combustion, both remained phlogisticians to the end of their days, as did most of their contemporaries.

Within the last half century the change that has made the most impression on the outside world and has led to the common belief that the older views have been completely given up and that radically new ones have taken their place, is that which is due to the gradual acceptance of what is generally known as the law of Avogadro. The conception embodied in this law is very simple. It is that the number of molecules contained in a given volume of a gas or vapor is the same, no matter what the gas or vapor may be, provided only that the temperature and pressure are the same. That it is difficult to prove the truth of this statement is evident from the fact that it was nearly a half century after it was propounded by Avogadro before it came to be generally accepted. Few, if any, accepted it at the time it was first put forward. The leaders tried to apply it to well-known facts and gave it up. And yet, in the light of facts discovered later, it came to be recognized as a fundamental truth of great value.

When Gibbs was teaching chemistry in the old Free Academy, Avogadro's law was not taught in this country and only a few of the younger teachers were beginning to teach it and to use it in Italy and Germany. It was a most confusing time for the student. According to the prevailing system, to take an example, the atomic weight or the combining weight or the equivalent of oxygen was 8, whereas, according to Avogadro, it was 16. And yet it was the same old oxygen that had been discovered by Priestley and Scheele, and it supported combustion in exactly the same way whether we assigned to it the atomic weight 8 or 16. How could both be true? I remember in 1867, when I finally decided to give up medicine and study chemistry, meeting a man who knew

a very little more chemistry than I did, who asked me what I thought of "the new chemistry." Not being willing at that time to confess my ignorance, I believe I said I thought very well of it, and in the silent watches of the night I often found myself wondering what was meant by "the new chemistry." Arriving in Germany, I found that the old masters like Liebig and Wöhler would have nothing to do with the new chemistry, while the younger teachers in the same universities used the new system. In the end the law of Avogadro prevailed, and now it is generally, I fear, taught dogmatically, and the evidence upon which it rests is lost sight of.

The conception that proved to be most fruitful during the period immediately following the acceptance of the law of Avogadro was that of the constitution of compounds as first clearly set forth by Kekulé in his great "Handbook of Organic Chemistry." Soon after the appearance of this book the majority of the younger chemists were ardently engaged in trying to determine the constitution of chemical compounds. Results came rapidly. The determination of constitution led, further, to efforts to build up natural substances artificially in the laboratory and factory. One of the first great successes in this line was the artificial preparation of the coloring matter of madder, known as turkey red, or alizarin. Since then achievements in synthetical chemistry have been innumerable. Great industries have been developed in the wake of these efforts and there seems to be no end to the possibilities. Perhaps the most sensational of the successes in synthetical chemistry is that which has culminated in the artificial preparation of indigo. It took about a quarter of a century to work out that problem—a problem that is of great interest not only to the chemist, but to the agriculturist, the political economist and the anthropologist.

Let us not forget that, while Kekulé's clearly expressed views gave the principal impetus to the work on constitution that led in turn to the work in synthetical chemistry, the way had been prepared by a long line of predecessors, among whom should be especially remembered Berzelius, Gay-Lussac, Laurent, Liebig, Wöhler, Dumas, Williamson and Frankland. Kekulé did not lead a revolution, he helped an evolution. The work in the field of synthetical chemistry is still progressing, and results as valuable as ever are being obtained. The problems under investigation are in general more difficult of solution than those that have already been solved. I need only mention in this connection the magnificent researches of Emil Fischer, of Berlin, on the synthesis of proteins, the complex substances that enter so largely into the composition of living things. It is of the highest importance that the chemistry of these substances should be worked out. The more we know about them, the better shall we be able to understand the mechanism of the living organism.

Within the last twenty-five or thirty years that branch of science which is called physical chemistry, and sometimes chemical physics, has been largely developed, and this has contributed to the advance of chemistry in many ways. The beginnings of physical chemistry are to be found, however, in the very beginning of the last century. Bertholet's work on "Chemical Statics," which appeared in 1801, may fairly be regarded as an important contribution to the subject, but more important, because more fruitful, was the work of Guldberg and Waage on the law of mass action which appeared in 1867. Since then, through the labors of Ostwald, Van't Hoff, Arrhenius and a host of others, physical chemistry has taken an independent position, and it may now be regarded as a new branch of science, occupying a field

midway between chemistry and physics, and helpful to both. We are in the era of ions. It took chemists many years to learn to use the words atom and molecule in a rational way. Now that they have learned this lesson fairly well, the ion has come in to plague them and—to help them. Here again it must be remembered that the ion is no new thing. Indeed we owe the word and the first conception to Faraday. But Arrhenius has emphasized its importance in connection with reactions that take place in solution and we have fallen captive. So thoroughly have we yielded to its influence that we are now using the ion as food for babes. It is an exception now-a-days to find one who has studied chemistry a few weeks who will not discourse at length on ions. Do not misunderstand me. I acknowledge gladly the great impetus that has come to chemistry through the conceptions of dissociation and ions, but I do question the desirability of attempting to introduce these conceptions at too early a period in the teaching of chemistry. The result must inevitably be dogmatic teaching and dogmatic teaching is not scientific teaching.

The development of physical chemistry has not interfered with the study of constitutional chemistry or of any other branch of chemistry, but has made it possible to interpret many phenomena more satisfactorily than formerly. The result of the application of physical methods to the study of chemical phenomena has been to give us more refined views and deeper insight. It is idle to claim that one method of investigation is higher than another. As Professor Nernst has recently said: "The question whether chemistry has profited most by the atomic theory or by thermodynamics is a foolish one. It is like the question whether Goethe or Schiller is the greater poet. Let us rejoice that we have two such poets. Let us rejoice that we have two such valuable methods of chemical research. We need all the aid we can possibly get and even with this aid progress will be relatively slow."

The latest developments in chemistry are in some respects the most remarkable of all. A recent writer has said: "The ideas which guide chemists when they use the molecular and atomic theory, when they apply the periodic law, when they deduce composition from crystalline form, when they use the hypothesis of ionization, when they discuss certain aspects of chemical affinity, when they connect changes of composition with changes of energy; these and many other guiding ideas are the gifts of the physicist to the chemist. The measure has been returned by the chemist 'pressed down and running over.' By the discovery of radium the chemist has called a new world into being; and, with a fine generosity, he has given it to the physicist to investigate." The study of radium and similar elements has led to most unexpected results of fundamental importance which have already thrown much needed light on the constitution of matter and have made it appear probable that electric charges, whatever they may be, are responsible for all forms of matter as well as for some forms of energy. But the statement that matter is made up of electric charges, however soothing it may be, raises the question what is an electric charge?—a question as difficult to answer as the older one, what is matter? Everything then resolves itself into electricity. Truly, "The old order changeth, yielding place to new." But not so fast. What we call matter still exists and the old phenomena presented by it still call for study, and will through eternity.

Let us finally return to the earth for a moment. Leaving out of consideration the theories that have grown out of the study of radioactivity, let us note the conclusion that has been forced upon us that the atom

is a changing system, that it is an aggregate of much smaller particles called corpuscles or electrons. This carries with it the thought that it may be possible to change one of the so-called elementary forms of matter into another, and some observations have already been recorded that seem to show that this possibility can in fact be realized. Sir William Ramsay has shown that, in the course of the decomposition which radium naturally undergoes, one of the products is another element, helium, and, further, it appears that, by allowing the emanation from radium to act upon copper, he has obtained a minute quantity of the element lithium. These observations have interested the chemical world profoundly. We are anxiously awaiting confirmation and further developments.

It has been suggested that, because some, and perhaps all, atoms are changing, the atomic theory, which for a century has been the principal theory of chemistry, is no longer tenable, that we must revise our entire terminology. It is hardly necessary to say to this audience that this is an extreme view. The atomic theory is as useful as it ever was. Under the conditions which surround us on the earth most atoms do not undergo change that can be discovered in any ordinary way. The atomic theory is based upon innumerable weighings. Now, the changes in weight which atoms undergo are not such as can be detected, so that we have as much evidence in favor of the atomic theory as we ever had, though we must supplement it by the conception of corpuscles or particles much smaller than atoms which can be given off from the atoms.

While chemistry is making rapid advances the great mass of knowledge of chemical phenomena that has been collected needs study now as in the past. No discoveries will ever make it possible to ignore oxygen and hydrogen and the other chemical elements and the compounds which they form with one another. I fear, however, that in our zeal for the new, we do not always give as much attention to the old as it deserves. I know that to talk in this way is furnishing evidence of my advancing years, yet, even at the risk of this, I wish to leave with you the thought that the new is built upon the old and includes the old. Chemistry was a great science fifty years ago. It is a greater science in the year 1908.

The presiding officer then said:

Fifty years is a long time. President Remsen has depicted the many and rapid changes that have come about in our science during that period. In 1852 Robert Ogden Doremus assumed the professorship of natural history in this college. Two years previous to this, while connected with the New York Medical School, he opened the first chemical laboratory for medical students in this country. The students of the College of Pharmacy, then without a home of its own, were allowed similar advantages in that laboratory. He soon extended this method of instruction to the Bellevue and Long Island Hospital Medical Colleges.

With a member of the faculty, who had already demonstrated unique activity in teaching chemistry, it was the natural and only thing to do, when Gibbs was called to the Rumford Professorship at Harvard in 1863, to ask Professor Doremus to transfer his activity to the chair of chemistry.

Then in unveiling the portrait of the late Professor R. Ogden Doremus, Professor Baskerville said:

This ardent devotee of science, this impressive teacher, this lover of art, poetry and all learning, occupied the chair for forty years, retiring in 1903.

In that time he was unremitting in his efforts to secure laboratory facilities for the students. The crowning of his labors in that direction came when the honorable board of trustees, as the result of his insistence, decided upon making one of this magnificent group of buildings a laboratory for the teaching of chemistry.

Professor Doremus, who never did anything on a small scale, was an eloquent and brilliant experimental lecturer. When I recall his charm of manner and courteous hospitality, his tremendous influence over the students of the college is easily understood, and it has been attested by Professor Remsen to-day.

It is fitting that his portrait be in this room, but for reasons familiar to chemists only a reproduction will remain here, but the name on the doors will serve ever to remind those who come of this successful expounder of the principles of our science through two generations.

Professor Baskerville then addressed the audience:

If, when Wolcott Gibbs was first professor in this college, he had told his students that we should soon read the history of the stars, he would have been said to be very erratic. Yet while he was still here, Bunsen and Kirchoff invented the spectroscope. While he was here mauve was discovered by Perkin and the coal-tar color industry started. While here oil was found in Pennsylvania and the great petroleum industry begun. If Gibbs, who was professor of physics and chemistry, had early said that nations would soon communicate across the depths of the ocean by cables, he would have spoken to incredulous listeners. Yet, as he left this institution, Cyrus Field laid the cable and William Thomson made its operation practicable.

If Doremus in the sixties had said that within a score of years the human voice would be recognized after transmission by wire for hundreds of miles, he would have been laughed at. Yet Graham Bell convinced the Emperor of Brazil and a distinguished group of interested scientific people in Philadelphia that it was an actuality.

If in the eighties Doremus, for he also was professor of physics and chemistry, had said in those remarkable and instructive lectures of his, that we should soon see through the human body, that nations would communicate across land and sea without connecting wires; if he had said that chemical elements would be found devoid of their characteristic property of chemical affinity; if he had said that chemical elements would be discovered which spontaneously and without chemical change produce vastly more energy than that evidenced in the most violent chemical reactions known—he would have been thought of as a man of delusions. Yet knowledge of all these things is common property at present.

In this day when a professor of chemistry publicly states that light and electricity are the same and that it is nearly proved (one of our distinguished speakers has done this and I believe he is right) he is greeted with a tolerant smile. So what of the "future in chemistry" in our day and generation? No one is better qualified to speak upon that subject than Professor Wilder D. Bancroft, whose esteemed and diplomatic grandfather epitomized the past. Dr. Bancroft, having drawn inspiration from the spirit of Gibbs at Harvard, is a daring and far-seeing investigator, whose vivid imagination visualizes the realms of the unknown, ever, however, holding it within reason.

Professor Bancroft then spoke upon

THE FUTURE IN CHEMISTRY

The future in chemistry! No two peo-

ple agree as to what the future development of chemistry is to be, and it is probable that any one man would give you a different answer if the question were put to him at an interval of five years. Depending on whom you ask, you will be told that the really important thing is: organic chemistry, inorganic chemistry, physical chemistry, electrochemistry, photochemistry, physiological chemistry, industrial chemistry, or what not. I could even name one man who has believed all these things at one time or another. It is easy to see that predictions like these are the results of opinion that exists. The same diversity of opinion as to what is fundamentally important appears very clearly when we remember that the Carnegie Institution is not making any large grant to chemistry, for the simple reason that the chemists of the country can not agree as to what problem or group of problems should be attacked. My task to-day is to point out to you what the real future of chemistry will be and to make you see that my prophecy is the one that will come true.

We shall reach our goal most quickly by what is at first sight an indirect way. At the dedication of a chemical, physical, engineering, geological, biological or medical laboratory, it is customary to have addresses, even as now; and it is the orthodox thing to say that the most important of all the sciences is the science to be studied in that laboratory, whether it be chemistry, physics, engineering, geology, biology, medicine or something else. I sympathize fully with the practise and I intend to do the same thing myself to-day. You will admit, however, that the people who make addresses of this type at the dedication of laboratories, can not all be right when they talk like that. Some of them must be exaggerating just a little, and in order to acquit the chemist of any such a charge, we must first consider the relation of chemistry to the other sciences.

We will define chemistry as a study of all properties and changes of matter depending on the nature of the substances concerned. This definition is wider than the usual one. It is one that I have used for years and it is one which Sir William Ramsay suggested but did not make in his "Introduction to the Study of Physical Chemistry." It follows from this definition that physics is a subdivision of chemistry; an important and interesting subdivision, it is true, but only a subdivision. Chemistry includes all of what is known as physics except the law of gravitation, the laws of motion, and a few other abstract formulations. Everything else that gives life and interest to physics is chemistry pure and simple. I admit that this point of view is not popular among my colleagues, the physicists, but their objections are natural enough without being valid. Physics was a flourishing science at the time when chemistry, in the narrower sense of the word, was of very little importance. In the case of anything that is expanding and developing, it seems to me axiomatic that you must have the part before we have the whole, and that in the first stages the part will seem the whole. In 1600 the men of Great Britain were the whole of the Anglo-Saxon race. To-day they are only a part of it; an important part, it is true, but only a part. Let us try another illustration. As children we were told that "great oaks from little acorns grow." If you only have the acorn, of course, it is the important thing; but later one sees that the acorn is merely an interesting subdivision or product of the oak and that is all it is. We may, therefore, class physics as a subdivision of chemistry.

When we come to engineering, it is clear that we are dealing with applied chem-

istry. If it were not for the specific properties of iron, copper, concrete, brick, etc., and of all the other materials of engineering, there would be no such subject as engineering. Speaking in a broad sense we may say that engineering is the art of making the structural properties of matter useful to man.

Geology is the study of the chemistry of the earth. This has been recognized for a long time, and though we speak of the Geophysical Laboratory at Washington, its work is geochemical in fact though not in name.

In biology of the present and future we are interested in the chemical changes in the living organisms due to heredity and environment. Growth is a chemical change. The internal and external structures of plants and animals are the result of a series of chemical changes. After the first stage of identification, enumeration and classification has been passed, the interests of the biologist are essentially chemical and the quality of his work is likely to increase as his methods become chemical. The work of Loeb in California is a striking instance of what may happen when a biologist realizes that his subject is a subdivision of chemistry.

In curative medicine we are dealing largely with the action of drugs. In preventive medicine we are dealing with inoculations, diet, exercise and fresh air. In the first case we are checking and eliminating an abnormal process, sickness, by the action of one set of chemicals on the system. In the second case we are preventing the occurrence of a disturbing chemical process, sickness, by the action of another set of chemicals on the system. Owing to the difficulties involved and to the number of variables concerned, our knowledge of the chemistry of medicine is not yet what it should be; but it is clear that real progress will be made just in so far as we study physiology and medicine as subdivisions of chemistry. I cite as an instance the brilliant work of Arrhenius in the field of immuno-chemistry.

I have tried to show you that physics, engineering, geology, biology and medicine are all subdivisions of chemistry. My task is over. The future in chemistry will consist in the change from chemistry as a coordinate science to chemistry as the dominant science. With this in mind can you wonder at the fascination which chemistry has for the chemist? Now you will see why I rejoice that to-day the world is to be the better for a well-equipped laboratory in the hands of a well-equipped staff.

In introducing the next speaker, Professor Baskerville said:

Dean Swift said a certain university was a learned place; most persons took some learning there, few brought any away, hence there was accumulation. This caustic arraignment is probably true of some institutions. Yet in my humble opinion, a college should not be regarded merely as a place of learning. I like to fancy it as a machine which grasps the refined, but still raw, metal of mentality and turns it out a tool fit for efficient citizenship.

M. Leroy-Beaulieu, who has shown a robust faith in the United States, has said that we are fast approaching undisputed leadership in practical things. According to Professor Munroe, and he is qualified to speak, in 1840 the coal production and consumption was one quarter ton per person in the United States; in 1860 it was one half; in 1880 one ton, and 1890 five tons. These figures show the increasing energy demands of a growing manufacturing country. The colleges must pro-

duce the men who utilize and direct these great forces.

We are peculiarly fortunate to-day in having as one of our speakers a man, a college man, the man whose successful constructive ability is seen in several powerful, but legitimate, morally legitimate, corporations, one bearing his name. His gratitude to the college course, his appreciation of its relation to the manufacturing world, have been evidenced in large generosity and his willingness to serve as chairman of the board of trustees of a great Polytechnic School in Brooklyn. I refer to Dr. W. H. Nichols, who will address us upon

THE COLLEGE COURSE AND PRACTICAL AFFAIRS

The dedication to the cause of higher education of this magnificient group of buildings on this superb site, marks an epoch in the history of our city. It is one of the glories of this country that the schoolhouse has always followed closely after the axe of the pioneer. Government by the people is not practicable where ignorance is the rule, or even the state of a considerable minority, and this fact was recognized by the fathers. A good common-school education has always been obtainable by a large majority of white children, outside of that neglected and almost unknown region in the Appalachian mountain belt. This city justly prides itself on its public school system, in spite of the criticism of those who do not make sufficient allowance for the difficulty of keeping pace with the tremendous growth in population; especially of that class in which a tendency towards "race suicide" is not noticeable, and whose children must be educated at the public expense, if at all. No one would venture to raise the question of the value as an investment of that portion of our taxes which goes into our common-school fund. All realize that we have here a plain instance of duty and self interest running concurrently.

A step upward in the development of our educational system brings us to the high school. Many scholars are so fortunately situated that they are not obliged to earn their own living on leaving the grammar school, and the city has provided for them a system of high schools which is exceedingly creditable. These turn out a goodly number of boys and girls who have much more than the rudiments of education, and are qualified to fill positions of considerable importance. It was found, however, that many of these were worth the cost of still higher education, and financially able to undertake the work. Hence the College of the City of New York, which to-day, after many years of experience in unsatisfactory quarters, dedicates this great plant to this purpose. I suspect that our city fathers in making the investment were not actuated solely by motives of altruism, but were looking for returns in better citizenship. The students and graduates of this institution must realize that their education has cost the city a large sum, which they should repay with usury in one or more of the many ways of usefulness open to cultured men.

It is a truism which few will question, that life, from conscious infancy to old age, is a school in which all who will take advantage of experience and mistakes as they occur will receive an education of a certain sort. Only the very stupid fail to profit in this way. It is astonishing to note how much may be daily added to one's store of knowledge by observation, if only we mean business, and "Knowledge is power." After all, is not one of the principal objects of the college course the training of the mind so that it may more surely and logically appropriate knowl-

edge thus offered? The great rank and file of our fellow citizens possess a large share of the total stock of that rare gift—common sense—and it is a fortunate thing for the country that it is not confined to what is sometimes called the "ruling class." It seems to be more inborn than acquired and I have never heard of a chair having been founded in any of our institutions of learning for instruction in this subject. It is one of the elements of wisdom, and wisdom is not necessarily learning. Knowledge is a fine foundation for wisdom, but it is not the only one. It is indeed power, but it may be a power for harm, which is not true of wisdom. Solomon said: "Wisdom is the principal thing. Therefore get wisdom." How to get it and how to keep it are very different questions, and are questions which every one must settle for himself. If Solomon be right, time can not be better spent than in seeking it, even if the quest occupy a lifetime. In all practical affairs, it is a most valuable asset.

I am asked to discuss briefly "The College Course and Practical Affairs." Now what are practical affairs? I suppose the comprehensive answer to this is that nearly all affairs are or should be practical. The mechanic, the farmer, the teacher, the merchant, the chemist, the engineer, in fact nearly everybody excepting possibly the pure theorist, and the impure loafer of both the corner and the society sort, is engaged in some kind of practical occupation. We even hear of practical politics. The measure of success or reward depends on fitness and application, not often on luck, unsuccessful ones to the contrary notwithstanding. Of course, allowance must be made for ill health or accident; but all other things being equal, the man who is best qualified by training, and does not neglect his opportunities, will come out ahead. The best training to make a good bricklayer is, of course, different from that needed to produce a good merchant, and both are totally unlike the preparation for a good chemist or a good lawyer. But the principle is the same. No one should neglect or omit a single step necessary to perfect himself in the trade, occupation or profession he seeks. And just here is where the rub comes in so many instances. The boy may not be qualified, or his parents may not help him intelligently to decide on the career for which he is best suited, and hence so many sad misfits and failures. One of the most important decisions a young man has to make is frequently postponed over and over again, or left altogether to chance, so that when the necessity for action arrives he is quite unprepared and hopelessly confused. Some may find themselves even at that late stage, and struggle out and up, but the majority will follow the line of least resistance, and drift down with the current, to an aimless and more or less useless existence.

It is then immensely important that as early as possible every boy should decide on the calling he feels best qualified to follow, and do all in his power to fit himself to make good in it. It must not be assumed that his success in life will be measured by the money he accumulates. We are all glad to acknowledge that the contrary view is becoming more and more generally accepted, and we are really beginning to feel a healthy contempt for the man who has nothing but money or other tangible property to recommend him. In fact even great learning will be found not to be sufficient. The man to receive universal respect and approval to-day must have character; and if he have this, and yet is without wealth or learning, even, he has the essential element of true manhood.

While I believe all this to be true, there is, of course, no doubt that the better edu-

cation a man has, the better he is qualified to enjoy his own life, and be of use to his fellow men. As the beauties of nature, of art and of literature, are better comprehended by him, his nature broadens, and his life grows fuller and richer. Whatever may be the ordinary grind of his daily existence, he moves on higher and ascending planes, and has for his more or less intimate companions the great of all ages. He has at his disposal fountains of pleasure and profit which the uneducated man knows not of.

As I said a while ago, life is a school in which all may be educated by hard knocks and experience. It is, however, not the only school, and the man who boasts that he is self-educated does not often have to prove the assertion. It is generally self-evident. I am aware that there are and have been many men who without the advantages of college training have become eminent in the fields of science and art and even literature. But they never boast of what they have accomplished under adverse conditions, but rather repine because they have been prevented from reaching far higher levels which would have been attainable if only they had been able to command a college education. The college, the university, the engineering school need no apologist. Their output of educated men and women is their sufficient answer to any heterodox critic who questions whether they are worth what they have cost in lives and means.

In order, however, that the college education may contribute all it should to the formation of the wisdom which we all seek, and which has so much to do with the satisfactory working out of practical affairs. care must be taken that it shall not turn out deformed men; that is men who are over-developed on some sides, and under-developed on others. We frequently hear that this is an age of specialists, and success in any field depends largely on specializing in that field. There is a good deal of truth in this, and yet it is not the whole truth. Specialization should not be carried to the point of deformity, if we want to qualify a man to be a practical success. I have known excellent engineers who could not write an intelligible report in good English, not because they did not understand the subject, but because they had not been taught to express themselves properly. No scientific student should be denied a thorough education in culture studies. Neither should an arts course man neglect chemistry, mathematics or the sciences in general. The course should be designed and arranged to turn out good all-round scholars, while at the same time paying due attention to specialization.

But however the course may be arranged, or whatever may be its shortcomings, no young man who has the chance should fail to take it, whatever kind of practical affairs he expects to engage in, unless, perhaps, he intends to learn a trade. But even in this case, a college course would be a luxury if not a necessity, and make him all the better artisan and citizen. We have only got one life to live, and one brain and body to carry us through it. Let us, therefore, do what in us lies—fit both brain and body for their tasks. This is indeed the beginning of wisdom.

Professor Baskerville then introduced the Honorable Herman A. Metz as follows:

When the trustees of our educational institutions tired of the theological fad, they looked to the departments of chemistry for managers of the corporations for which they were held responsible. In seeing some of the most distinguished of these gentlemen before me, I hesitate to call the roll, but realize how unfortunate it has been for our science, but how fortunate for those institutions that professors of chem-

ical economics have become their presidents. A more recent movement in the selection of college and university presidents has shown a favoritism to political economists. Perhaps a combination may prove the best solution. A live wire carries energy; if insulated it is safe. Professional modesty forbids me from mentioning which is the wire.

A physical chemist sits as a member of the privy council of Great Britain and is helping in the readjustment of its politico-economic policy. A plain, but distinguished, chemist was for years a senator and member of the cabinet of France during its trying period of recovery from disastrous conflicts without and within. Our nation has been so blessed in natural resources that it has achieved a reputation for extravagance, national, communal and personal. "In times of affluence prepare for depression," is a trite rendering of an expression usually enunciated in simpler words. In recent times no chemist has had a voting voice in affairs at Washington. It was fortunate for our city that in a time of the fullest prosperity it should place in charge of its finances a chemist who had known the needs of laboratory economy and the benefits of earned prosperity. For he successfully applied those principles to the municipality in times of stress, and perhaps will yet apply them for the welfare of the nation. I have the honor of presenting the Comptroller of the City of New York.

Mr. Metz spoke of the important part the chemist plays in the control of structural work, the purchase of supplies, health and happiness of the community, and emphasized the reliance a large municipality should place in the chemical profession. He called attention to the immense saving to the City of New York which had come about through his establishing a chemical laboratory in conjunction with the department of finance. He expressed his obligation to his course in chemistry in the Cooper Union, and the gratification of the city officials at present in power in having had a part in completing the handsome buildings of the college of the city where the high and low alike might secure adequate preparation for their life work.

In presenting the Honorable James W. Hyde, the secretary of the board of trustees, Professor Baskerville referred to Mr. Hyde's reluctance to appearing too prominently at public functions where such striking evidence of his remarkable executive capacity was to be seen on every hand. After thanking those who had come for their presence, Dr. Baskerville said: "Come again. This college and its every department is yours. It belongs to you, to me, to every man, woman or child of our great city, who pays taxes or rent, and you have a right to know whether we keep the faith."

Mr. Hyde then formally opened the building and declared it fit for the use for which it was devised.

At the conclusion of the exercises, an informal reception was held by the speakers and the laboratory was inspected by parties under the direction of the various members of the staff.

SCIENTIFIC BOOKS

Conductivity and Viscosity in Mixed Solvents. By HARRY C. JONES, Professor of Physical Chemistry in the Johns Hopkins University, and C. F. LINDSAY, C. G. CARROLL, H. P. BASSETT, E. C. BINGHAM, C. A. ROUILLER, L. MCMASTER and W. R. VEAZEY. Carnegie Institution of Washington, Publication No. 80. Pp. v + 235.

In this volume are presented the results of an extended series of investigations on the electrical conductivity and viscosity of solutions of certain electrolytes in water, methyl alcohol, ethyl alcohol and acetone; and in binary mixtures of these solvents.

The conductivity measurements have brought to light a bewildering range of behavior on the part of the solutions studied. In the first place, it appears that in practically all mixtures into which water enters as one of the constituents of the solvent, the molecular conductivities show a minimum value for a certain composition of the solvent. In the second place it is shown that in mixtures of the alcohols, the conductivity follows the law of averages, that is, the conductivity of solutions in such mixtures is usually approximately the mean calculated from the conductivities of equimolecular solutions in the pure solvents. Finally, in mixtures of the alcohols with acetone, the molecular conductivities generally show a maximum value for certain mixtures.

These relations, however, hold only in broadest outline; so complex indeed are the observations that it would be useless to attempt an account of them in the limits of a review.

As the result of a long series of measurements of viscosity of mixed solvents and their solutions, there has been shown to exist a parallelism between the fluidity—that is, the reciprocal of the viscosity—of a solvent and the conductivity of its solutions, whence it is concluded that electrical conductivity is largely dependent upon the fluidity of the solvent. The parallelism between fluidity and conductivity is shown to be only approximate, however, for upon the effect of fluidity on conductivity is superimposed the effect of the degree of dissociation of the solute and also the size of the sphere of solute which is assumed to be in combination with the ion and to affect the speed with which it travels through the solution.

The experimental results are discussed at length and hypotheses are offered in explanation of the diminished fluidity of the solvent mixtures containing water; of the increased fluidity of certain mixtures of the alcohols and acetone; of the approximately normal behavior of mixtures of the alcohols with respect to fluidity; of the obvious dependence of electrical conductivity on fluidity; of the observed deviations of the conductivity curves from the fluidity curves; of the effect of temperature on the conditions prevailing in solutions in mixed solvents; of the effect of the presence of ions of high atomic volume on the viscosity of solvents; and of what seems to be the greater ionizing power of certain mixed solvents over that of either constituent of the mixture.

Altogether a very extended series of relationships have been discovered and a number of ingenious hypotheses have been offered which are certainly of the greatest importance as contributions to our knowledge of solutions.

E. C. FRANKLIN

Elementary Experiments in Psychology. By CARL F. SEASHORE, of the University of Iowa. Pp. 218. New York, Henry Holt & Co. 1908.

Had this very valuable manual appeared a few weeks earlier, a notice of it would have been incorporated in the review of Professor Judd's handbooks of psychology (SCIENCE, May 15, 1908). Like the Judd volumes it testifies to the increasing need of serviceable handbooks for the presentation of the experimental attitude to students of mental processes. Like the Witmer handbook, Professor Seashore's manual contains within its own covers (with the aid of a few simple properties to be found in every household) a considerable range of experiments illustrative of psychological principles. Unlike the Witmer volume, it is not at the same time a text, but merely a companion manual to any text or course. It should be said with the brevity as well as with the emphasis characteristic of the book itself that it accomplishes its purpose with exceptional skill. Its appeal is to a very general clientele. There is hardly a course in psychology so brief or elementary as not to make possible the introduction of the experimental method on the scale provided by Professor Seashore. Let it also be said that while the scope of the work is elementary, its spirit and discernment are sufficiently advanced to arouse in all disposed thereto a proper "student" psycho-

logical reaction. Always direct, terse, clear, explicit, the directions lead unmistakably to the illustration of principles. No more suitable treatment for the purpose in view could be wished for. Its only fault is freely admitted: the selection of experiments in part for their ease of execution without facilities, and hence a rather uneven range of importance and significance. For beginners' courses in psychology of modest scope the manual may be warmly recommended.

J. J.

SOCIETIES AND ACADEMIES

THE IOWA ACADEMY OF SCIENCE

The twenty-second annual meeting of the Iowa Academy of Science was held at the State Normal School at Cedar Falls on Friday and Saturday, May 1 and 2, with twenty-seven members in attendance.

The president of the academy, Professor John L. Tilton, of Simpson College, gave the presidential address on the subject, "Science required for a General Education." The evening lecture was given by Professor Moulton, of Chicago University, on "Old and New Theories of the Formation of the Earth." The lecture was a critical comparison of theories and was illustrated by most excellent stereopticon slides.

Friday afternoon and Saturday forenoon were devoted to the reading and discussion of papers. A few of the papers were read by title while the others were read in full and quite thoroughly discussed.

Resolutions were adopted with reference to the death of Lord Kelvin, and also with reference to the use of the metric system of weights and measures. The latter resolution is as follows:

Whereas, the metric system possesses great advantages over the system now in common use and is being adopted more and more throughout the world, and is used without difficulty, with facility and satisfaction, in American shops upon foreign work, be it

Resolved, That the Iowa Academy of Science again express its conviction that the exclusive use of this system for all public transactions is highly desirable, and be it

Resolved, That Congress be urged to pass legislation looking towards the introduction of the metric system for general use in the United States at as early a date as possible.

Officers elected for the ensuing year are:

President—Samuel Calvin, State University of Iowa.

First Vice-president—Frank F. Almy, Iowa College.

Second Vice-president—S. W. Beyer, Iowa State College.

Secretary—L. S. Ross, Drake University.

Treasurer—H. E. Summers, Iowa State College.

Elective Executive Committee—D. W. Morehouse, Drake University; R. B. Wiley, State University of Iowa; Louis Begeman, Iowa State Normal School.

The program as presented is given below. The brief abstracts accompanied the papers at time of presentation.

Review of Solar Observations made at Alta, Iowa, during the Past Five Years: David E. Hadden.

A brief review of sunspot observations during the years 1903 to 1907.

The Vitality of Weed Seeds under Different Conditions of Treatment and a Study of their Dormant Periods: H. S. Fawcett.

The object of the investigation recorded in this paper is to make a comparison of viability of different species of weed seeds, especially those found in cultivated fields and pastures, and to study their dormant periods in order to determine possible means of destroying these weeds. Plantings were made under out-door and in-door conditions. Conclusions: that seeds require a rest period; that natural conditions shorten this dormant period; that best germination indicates fall and spring as the two natural periods; that in general, percentage of germination was low. The paper is accompanied by tables summarizing the experiment.

Some Seeds of the Genus Pyrus: L. H. Pammel.

A brief study of the minute morphology of the seeds of the more common cultivated apples along with the specific gravity. The differences in some of the forms is quite marked,

the seeds consisting of the testa of from four to six differentiated layers and the perisperm, endosperm and embryo.

The Genesis of the Loess, a Problem in Plant Ecology: B. SHIMEK.

The influence of plants in building up sand-dunes, soils, etc. The probable readvance of the flora after the recession of the ice sheets, viewed in the light of modern ecological observations. Evidence of the presence of an abundant flora during the deposition of the loess; snails, etc. Root-marks, iron tubules and calcareous nodules of no value, as they were formed after the loess was in place. Comparison of the distribution of modern plants and of the loess. The probable mode of loess accumulation: chiefly by wind; water deposition relatively insignificant. Comparison of the loess of the Missouri, the Mississippi and the Iowan border made on ecologic grounds. Illustrated by slides.

A Hybrid Oak: B. SHIMEK.

A description of a probable hybrid oak, *Quercus imbricaria palustris* from Johnson County.

Notes on Peronosporales for 1907: GUY WEST WILSON.

The meteorological conditions of the season are reviewed briefly and notes given on the occurrence and abundance of both conidia and oospores of sixteen species of the order.

A Key to the Families of Ferns and Flowering Plants of Washington: T. C. FRYE.

The Forestry Problem of the Prairies of the Middle West: HUGH P. BAKER.

Notes on the Routine Diphtheria Determination in the Laboratory: L. S. ROSS.

A brief comparison of work in a few laboratories.

Isolation of Diphtheria Bacilli from Serous Fluid of a Cadaver: L. S. ROSS.

A recent case of such an isolation is reported.

The Uric Acid Ferments: E. W. ROCKWOOD.

The Determination of Ferrous Iron: NICHOLAS KNIGHT.

The ferric iron was determined in siderite in the form of a coarse powder and again when very finely powdered. The fine powder gave a higher percentage of ferric iron. The heat produced by finely grinding the mineral in the agate mortar changes a small quantity of ferrous to ferric oxide.

The Decomposition of Dolomite: NICHOLAS KNIGHT.

In many localities the top layer of the Niagara dolomites, to the depth of a few inches, appears to be decomposed and presents a mealy appearance. Chemical analyses were made of this to compare its composition with the normal rock. A still more highly decomposed portion appearing like a ferruginous clay was likewise investigated.

The Life of Portland Cement: G. G. WHEAT.

The Loess of the Paha and the River-ridge: B. SHIMEK.

A review of the accounts of distribution, structure, composition and contents of the paha and river-ridges (with special reference to the loess) of McGee, Norton and others, supplemented by the writer's observations. The age and genesis of this loess are discussed, the conclusion being that the loess is in part post-Kansan, but largely post-Iowan, in the latter case being often closely associated with old sand-dunes. Illustrated by slides.

Some Peculiarities in the Elastic Properties of Certain Metals: K. E. GUTHE.

An Experimental Determination of the Charge of an Electron by Wilson's Method, using Radium: L. BEGEMAN.

Nucleation According to Barus: L. BEGEMAN.

Evaporation from Water Surfaces exposed to the Sun: A. G. SMITH.

The Protozoa of Fayette, Iowa: GUY WEST WILSON.

During the fall term of 1908 a number of cultures were brought into the laboratory for class use and as the Protozoa were rather abundant notes were made on the abundance and sequence of species in cultures from various sources. These data are presented in the form of an annotated list of species.

Exhibit of Photographs of Delicate Marine Animals taken from Life in Sea Water: C. C. NUTTING.

A Study in Wing Venation, Family Aphididæ: C. E. Bartholomew.

Protective Adaptations in the Nesting Habits of Some Central American Birds: M. E. Peck.

Revival of an Old Method of Brain Dissection: H. J. Hoeve.

Myxomycetes of Iowa: T. H. McBride.

Stratigraphic Position of Red-Beds: Charles R. Keyes.

The possible significance of the Fort Dodge gypsum beds is discussed on the theory that they are Carbonic in age, recent data bearing upon the Red-Beds problem as obtained in southwestern United States being correlated with the Iowa section.

Some Relations of the Older and Younger Tectonics of the Great Basin Region: Charles R. Keyes.

The moot questions regarding the origin of the basin ranges of western America are discussed in the light of the latest observations in the region. Two distinct periods of mountain building are recognized, the older of which is not considered as having any influence on the genesis of the present mountains. The present aspect of the existing ranges is chiefly due to erosive action of eolian character and under the peculiar conditions of an arid climate.

Eolian Origin of Certain Lake Basins of the Mexican Tableland: Charles R. Keyes.

Extensive lake basins in the various bolson plains of the northern part of the Mexican tableland are shown to occur under conditions that indicate clearly that the basins were hollowed out by wind action, under conditions of extreme aridity. The phenomenon is believed to be one of the minor and temporary results of general desert leveling in an arid region.

L. S. Ross,
Secretary

THE NORTH CAROLINA ACADEMY OF SCIENCE

The North Carolina Academy of Science held its seventh annual meeting at the State Normal College, Greensboro, N. C., on Friday and Saturday, May 1 and 2, 1908.

The academy was called to order at 3:30 P.M., May 1, by the president, T. Gilbert Pearson. A letter of welcome to the academy from President J. I. Foust, of the college, was read. A response to this welcome was made by the retiring president, Collier Cobb, of the academy.

At 8:30 P.M. the academy met in the auditorium of the Students' Building and the presidential address, "An Historic Sketch of Ornithology in North Carolina" (illustrated by lantern slides), was delivered by President T. Gilbert Pearson. Following this address, a reception was tendered the members of the academy by the faculty and students of the senior and junior classes of the college in the dining-room of Spencer Building.

At 9 A.M. Saturday, May 2, the academy convened for a business meeting. Reports of various committees were heard. The report of the treasurer showed a balance of $119.60. Seven new members were elected. The following officers were chosen for the ensuing year:

President—Tait Butler, Department of Agriculture, Raleigh, N. C.

Vice-President—J. J. Wolfe, Trinity College, Durham, N. C.

Secretary-Treasurer—E. W. Gudger, State Normal College, Greensboro, N. C.

Executive Committee—Chas. H. Herty, University of North Carolina, Chapel Hill, N. C.; John F. Lanneau, Wake Forest College, Wake Forest, N. C.; W. H. Pegram, Trinity College, Durham, N. C.

The next meeting of the academy will be held at Trinity College, Durham, N. C., May, 1909.

The following papers were presented:

The Amanitas of the Asheville Plateau: H. C. Beardslee, of Asheville, N. C.

The following list of species was reported: *Amanita cæsarea* Scop., *A. virosa, A. phalloides* Fr., *A. muscaria* Linn., *A. pantherina* DC., *A. junquillea* Quel., *A. strobiliformis* Paul., *A. solitaria* Bul., *A. echinocephala* Vitt., *A. rubescens, A. cinerea* Bres., *A. nitida* Fr., *A. vaginata* Fr., *A. volvata* Pk., *A. farinosa* Schw., *A. mappa* Fr.

The species *A. verna, virosa,* and *phalloides* were considered as not distinct.

Amanita junquillea Quel. was illustrated by photographs and specimens and compared with the European forms. The American *A. russuloides* Pk. was referred here, also the European species *A. amici, adnata,* and *vernalis.* Photographs and specimens had been seen by Bresadola and Boudier, who verify this conclusion. Specimens of the European form had also been examined.

Amanita cinerea Bres. was shown to include *A. spreta* Pk. *A. volvata* was shown to be the plant referred by Quelet and Bataille to *A. coccola* Scop. It was also considered the true *A. agglutinata* of Curtis, and *A. baccata* as understood by Bresadola.

Photographs of many forms of *A. solitaria* and its allies were shown illustrating the difficulty of successfully defining species in this much-confused group.

Distribution and Migration of Warblers at Raleigh: C. S. BRIMLEY, of Raleigh. (No abstract furnished.)

An Adjustable Armillary Sphere—Newly Designed: J. F. LANNEAU, of Wake Forest College, N. C.

This paper dealt with a unique piece of apparatus—a light, symmetrical mechanism, built by Wm. Gaertner & Co., Chicago, after Professor Lanneau's design—for class-room use in Wake Forest College.

Its special feature is the placing of the horizon plane and vertical circles *within* the celestial circles, and the two concentric systems, mechanically *independent,* allowing of the real eastward rotation of the former, or of the apparent westward rotation of the latter.

Some Illustrations.—1. An aluminum ball at the center represents the sun; and by a simple device a smaller ball revolves around it eastward in the plane of the ecliptic, representing the earth's annual motion.

2. With central ball representing the earth, to it is securely attached the horizon plane and vertical circles for, say, an observer in latitude 36° north. Clamping the celestial circles in fixed position, the earth-ball with its horizon system is easily rotated eastward, showing sunrise and sunset and the rising and setting of moon, stars and planets—these objects being suitably indicated, for any given date, in their apparent places on the celestial framework. Or clamping the horizon in its seemingly fixed position, the celestial circles and objects in place are readily rotated westward in accord with familiar appearances.

3. Altering in latitude the attachment of the horizon plane to the earth-ball, the apparatus shows in turn the reality and the appearances to an observer at the equator; or, again, to an observer at the north pole during his six-months' day and his six-months' night.

4. Some circles and the celestial objects may be variously adjusted and placed for an indefinite number of astronomical illustrations.

5. Selected circles and objects may be duly disposed to facilitate apprehension and solution of numerous celestial problems—and, of problems also in geodesy and navigation which involve the ever-recurring "astronomical triangle."

Question and Answer.—Are the earth and sun at the center? They are not held to be at the center of the myriad stars of the visible universe. They are at the center of the "celestial sphere," conceived of as everywhere equidistant from the earth; so distant as to be beyond the remotest star. Its quasi reality is that vast shell of void space beyond the stars, upon which as a dark, spherical background all the stars appear fixed as viewed from the central earth. So measureless its remoteness, any point within the earth's comparatively little orbit, including the sun, is virtually its center. This "celestial sphere," with sun or earth as center, is the basis of practical astronomy. Its standard circles in miniature are part of our armillary sphere.

Concerning Sclerotinose of Lettuce: F. L. STEVENS and J. G. HALL, of the North Carolina Experiment Station, Raleigh.

The term sclerotinose was proposed as a designation for diseases caused by *Sclerotinia,* and sclerotinose of lettuce was characterized as one form of lettuce drop caused by *S. libertiana.*

As the result of two years' study the authors conclude that the only part of the fungus that lives through the quiescent period of the disease is the sclerotium and that each season's infection is by wind-borne ascospores produced from these sclerotia. They recommend that the formation of sclerotia be prevented by early removal and destruction (incineration or burial) of infected plants. This course followed for a few years, accompanied by the exhaustion of all sclerotia originally in the soils by germination, seems promising as a means of ridding infected regions of the pest.

The Origin of Certain Topographic Features along the Sand-hills Border of the Atlantic Coastal Plain: Collier Cobb, of the University of North Carolina. (No abstract furnished.)

Notes on the Life Zones in North Carolina: C. S. Brimley and Franklin Sherman, Jr., of Raleigh, N. C.

The authors, having made a detailed study of all available records of the occurrence and distribution of animals in the state, present their conclusions as to the probable boundaries of the different life zones. The groups of animals chiefly relied upon are mammals, reptiles and batrachians. Birds and insects have been used mainly to confirm ideas otherwise originated.

It is found that four distinct life zones are represented in the state as follows:

1. *The Canadian Zone,* including only the tops of the higher mountains, usually above 4,500 feet elevation. The following places are placed in this zone: Black Mountain, Roan Mountain, Grandfather Mountain, Bald Mountain in Yancey County, and the higher mountains in Macon County near Highlands.

2. *The Alleghenian Zone* includes practically all between the elevations of 2,500 feet and 4,500 feet. This includes most of the Blue Ridge, Smoky Mountains, Nantahala Mountains, Balsams, Pisgah Ridge, and the lower elevations of Black Mountain and others mentioned as belonging to the Canadian zone.

3. *The Upper Austral Zone* includes all of the state north and west of a line drawn from Suffolk, Va., to Raleigh, thence to Charlotte, thence to the South Carolina line near Tryon in Polk County; except that portion already assigned to the Canadian and Alleghenian zones.

4. *The Lower Austral Zone* includes all of the state to the south and east of the line just mentioned.

Lists are given of the characteristic animals known in each of these zones, and mention is made of a number of exceptional records, where animals have been taken beyond the limits of what their range would supposedly be.

The counties in the extreme northwest part of the state have not yet been zoologically explored, and are therefore not yet assigned to any zone, awaiting the accumulation of more records.

The Relation of Bovine Tuberculosis to the Public Health: Tait Butler, of the Department of Agriculture, Raleigh. (No abstract furnished.)

The Twenty-seven Lines upon a Cubic Surface: Archibald Henderson, of the University of North Carolina.

In his paper Dr. Henderson explains that by the selection of a highly symmetrical equation of a cubic surface:

$$\left(\frac{x}{x_2}+\frac{y}{y_2}+\frac{z}{z_2}+\frac{w}{w_2}\right)\left(\frac{xz}{x_1z_1}-\frac{yw}{y_1w_1}\right) - \left(\frac{x}{x_1}+\frac{y}{y_1}+\frac{z}{z_1}+\frac{w}{w_1}\right)\left(\frac{xz}{x_2z_2}-\frac{yw}{y_2w_2}\right)=0;$$

by a proper choice of constants x_1, y_1, z_1, w_1; x_2, y_2, z_2, w_2; and finally by employing a regular tetrahedron as tetrahedron of reference, that it was not difficult to derive very simple and symmetrical equations of the twenty-seven lines upon the cubic surface, and therefore to construct a string model of the configuration, showing the fundamental tetrahedron and the twenty-seven lines in proper relation to each other and to the fundamental tetrahedron. Instead of a string or wire model, he exhibited a beautiful perspective drawing in colors of the configuration.

The Scope and Function of Science: Wm. Louis Poteat, of Wake Forest College. (Read by title.)

Some Trials of a Museum Curator: H. H. Brimley, State Museum, Raleigh. (Read by title.)

The Oral Gestation of the Gaff Topsail Catfish, Felichthys marinus: E. W. Gudger, of the State Normal and Industrial College.

This paper was given by permission of the Commissioner of Fisheries and will later be published in the *Bulletin* of the bureau.

The Proximate Constituents of the Oleoresins of Pinus palustris and Pinus heterophylla: Chas. H. Herty, of the University of North Carolina. (No abstract furnished.)

The San José Scale: Franklin Sherman, Jr., entomologist, North Carolina Department of Agriculture, Raleigh, N. C.

The paper opens with an apology and explanation for presenting so threadbare a subject before the academy—stating, however, the author's belief that popular presentation of subjects of economic interest to the state should have a conspicuous place on the program.

A brief account of the history and general distribution of the San José scale (*Aspidiotus perniciosus*, Comst.) is given, and mention is made of the principal food-plants and methods of spread of the insect.

Referring to conditions within the state of North Carolina it is shown that present records indicate the pest in 65 counties, at 145 different post-office localities, and on at least 423 different premises. It is a *safe presumption* that it is in many localities in addition to those on record. It is a *reasonable presumption* that it is in every county in the state, but it *can not be presumed* that it is in every locality—and there is every reason to believe that many individual premises are not yet infested by it.

In at least seventeen communities it is generally distributed, having been found in a number of the orchards and perhaps in all. In the west it is known in the counties of Cherokee, Haywood, Mitchell, and Watauga—and in the east in the counties of Brunswick, New Hanover, Carteret and Pasquotank. It is found only a few feet above sea-level, and at an elevation of 4,000 feet.

According to present records the worst-infested counties are as follows in order of infestation: Catawba, Surry, Guilford, Moore, Gaston, Wade, and Polk.

Concerning the Difference of Behavior of Soil Organisms when in Solutions and when in Soils: F. L. Stevens and W. A. Withers, of the North Carolina Experiment Station, Raleigh. A preliminary report of work done by F. L. Stevens and W. A. Withers, assisted by W. A. Syme and J. C. Temple.

Results of numerous experiments were adduced to show that the activities of ammonifying, nitrifying, denitrifying, and nitrogen-gathering bacteria are different in soils from what they are in solutions and that no adequate knowledge of the efficiency of these various soil organisms in effecting chemical change can be attained by tests conducted in solutions. Even the relative powers of different organisms or of different soils is largely affected by the conditions of the test. It seems, therefore, that in the study of soil bacteria the work must be done with soils rather than with solutions, or at least that frequent controls or checks in soil must be made.

How to Study the Common Rocks: Collier Cobb, of the University of North Carolina. (No abstract furnished.)

E. W. Gudger,
Secretary

THE PHILOSOPHICAL SOCIETY OF WASHINGTON

The 650th meeting was held on May 9, 1908, President Bauer in the chair.

Professor Harry Fielding Reid, of Johns Hopkins University, presented, by invitation, an interesting paper on the "Mechanics of the Californian Earthquake" (1906).

The surveys of the United States Coast and Geodetic Survey during 1874–91 and 1906–7 as discussed by Dr. Hayford show that between these dates the earth on opposite sides and at some distance from the great fault was relatively displaced about six feet. At the time of the rupture on April 18, 1906, the opposite side of the fault plane shifted about twenty

feet and the displacement diminished as the distance from the fault plane increased. A consideration of the origin of the forces which produced the break shows that they must have been the result of an elastic strain set up in the rocks by the slow movement of the ground at a distance from the fault, and that the strain was of the nature of a shear, and did not consist of compressions and extensions, such as accompany the ordinary bending of beams. The difference in the amount of the displacement at the fault end and at a distance shows that about two thirds of this strain must have existed already at the time of the earlier survey. An analysis of the forces which produced this slow displacement shows that they must have been applied at the under surface of the displaced area, and not at its boundaries, and that they must have been applied in a definite way. The force at the fault plane at the time of the rupture must have been 2,000 pounds to the square inch, and it is probable that the rock in an uninjured condition was too strong to break under this force. It seems probable, therefore, that the old break along the fault plane had not become completely consolidated, and broke under a smaller force than was necessary to break the fresh rock. By analogy with the underground flows which the theory of isostasy has shown exist, it was suggested as a possibility that underground flows might cause dragging forces on the rock above and thus set up the strain which caused the rupture along the fault plane.

Mr. C. K. Wead presented a brief paper on "Efficiency." The word had come down through the medieval Latin with the loose popular meanings which it still retains. But in 1854 Rankine seized it, stamped on it a technical meaning and gave it currency where it was greatly needed. The definition he gave, in the course of his studies on the steam engine, was, "*The efficiency of a machine is the ratio of the useful work performed by it to the whole work expended on it.*" This test of efficiency, which is applied everywhere in mechanical engineering, is coming to be applied in almost every line of human activity, even though the quantities to be compared are not always commensurable. For illustration, reference was made to manufacturing, transportation, administration, the so-called trusts, philanthropies, war, scientific terminology and so on.

R. L. Faris
Secretary

THE GEOLOGICAL SOCIETY OF WASHINGTON

At the 206th meeting of the society, held on Wednesday evening, May 13, in the Cosmos Club, the following papers were presented:

Regular Program

The Unconformity between the Mississippian and Pennsylvanian Rocks in Western Pennsylvania, and its bearing on Questions of Geologic Correlation: Chas. Butts.

In the anthracite basins the Pottsville is 1,200 feet thick, the Mauch Chunk, 2,000 and the Pocono, 1,000. On the Allegheny front, in Blair County, the Pottsville is 130 feet thick, the Mauch Chunk, 180, and the Pocono, 1,100. The Connoquenessing sandstone near the top is the oldest Pottsville present. In Allegheny Valley, at Kittanning, the section is the same as the last, except that the Mauch Chunk is missing. The top, 400 to 500 feet, of the Pocono is a sandstone, unbroken in the Allegheny front but more or less broken by beds of shale in Allegheny Valley. This is the Burgoon sandstone of the U. S. Geological Survey, the "Big Injun" sand of the oil-well drillers, and the Logan and Black Hand formations of the Ohio geologists. In Lawrence County the Burgoon is absent, and the lowest Pottsville rests on middle Pocono beds. The Burgoon forms the lower part of the Allegheny Valley walls. The Kittanning region north to Tionesta, where it is eroded off, and the Connoquenessing rests on middle Pocono. At Warren the whole Pocono is eroded and the Pottsville (Olean or Sharon conglomerate) rests on the underlying rocks. These facts indicate an uplift of west and central Pennsylvania at the close of Mauch Chunk time, with the erosion of all the Mauch Chunk and part, or all, of the Pocono along a strip extending from Newcastle to Warren, the axis of the uplift lying along that line.

The submergence of this area proceeded from the west, the axial part being overlain by Olean conglomerate, while the part of the area from Allegheny Valley to the Allegheny front received only the Connoquenessing sediment of later age than the Olean. The correlations following from the conditions described are as follows: The Pocono equals the Waverly, the Burgoon at the top being the same as the Logan group of Orton; the beds immediately below the Olean conglomerate in western New York and Pennsylvania are the equivalent of the top of the Erie shale in Ohio; the Salamanca conglomerate is the same as the Venango third oil sand instead of the first oil sand, as supposed by the Pennsylvania geologists; and the Berea sandstone is the first oil sand of Venango County and the 100-foot sand of southwestern Pennsylvania.

The Grand Gulf and Lafayette Formations in Northern Florida: FREDERICK G. CLAPP.

Overlying the Tertiary formations of northern Florida are three types of surface deposits, similar in sequence and character to the Grand Gulf, Lafayette and Columbian formations of adjacent states. The most recent of the Florida deposits (Columbian) is a fine-grained, quartz sand, a few feet in thickness, largely wind-blown and covering nearly the entire state. This sand overlies the so-called Lafayette beds with a marked unconformity. The Lafayette is distinguished from the Columbian by its coarser nature, its abundant water-worn quartz pebbles, its deep surface oxidation, its greater thickness, and its older topography. Below it is a series of quartz sands interstratified with beds of plastic clay (correlating with the Grand Gulf formation of Dr. E. A. Smith in Alabama), the whole ranging in thickness from a few feet in northeastern Florida to 500 feet or more in northwestern Florida. This formation is of estuarine origin. In northwestern Florida numerous flat-topped hills have an average elevation of 250 feet, and are capped by Lafayette. They appear to be remnants of a once extensive terrace of probable Grand Gulf age. At Pensacola the records of deep borings from which fossil shells have been brought up corroborate Smith's evidence at Mobile that his Grand Gulf formation is of late Pliocene or early Pleistocene age.

The deposits hitherto classed as Lafayette in northwestern Florida are complex and consist of parts of several formations. What is presumably the true Lafayette form a mantle covering a wide range of topographic conditions from the top of the 250-foot terraces to the bottom of many valleys. These deposits are believed to be largely of fluvio-terrestrial origin, and were presumably formed during a considerable period of denudation succeeding the Grand Gulf deposition. Hence where the Lafayette beds are of highest elevation they are nearly or quite conformable with the Grand Gulf and were formed early in the Lafayette epoch; while similar deposits in the valleys show strong unconformities and are much more recent.

Brief Discussion of the Copper Deposits of Kasaan Peninsula, Southeastern Alaska: C. W. WRIGHT. (No abstract.)

RALPH ARNOLD,
Secretary

ELISHA MITCHELL SCIENTIFIC SOCIETY OF THE UNIVERSITY OF NORTH CAROLINA

THE 178th meeting was held in the main lecture hall of the Chemical Laboratory, April 28, 1908, 7:30 P.M. The program was as follows:

"Stresses in Masonry Dams," by Professor William Cain.

"Pathologic Effect of Alcohol on Animals," by Professor W. DeB. MacNider.

A. S. WHEELER,
Recording Secretary

THE ORAL OPENING OF THE NASAL CAVITY IN ASTROSCOPUS

ANY communication between the nasal cavities and oral cavity is rare among the fishes, being found in the case of the Dipnoi and hagfishes.

While studying the electric organ of *Astroscopus guttatus* the writer found well-developed posterior nostrils opening into the oral cavity from each nasal cavity. A brief study

of the organs in action showed them to be used as intakes for water during inspiration. They are used in this way both while the mouth is so used and also when it is closed tightly. Each of these two internal openings is provided with an independent valve which automatically prevents the regurgitation of water.

Besides these openings the nasal cavity is also provided with the usual anterior and posterior nares. A fuller account of this structure will appear shortly in another journal.

Ulric Dahlgren

SPECIAL ARTICLES

BLACKHEAD, A COCCIDIAL DISEASE OF TURKEYS[1]

In many districts of the United States, and in Rhode Island in particular, there has been known to exist since about 1894 a highly infectious disease affecting the ceca and liver of turkeys and, to a less extent, of fowls. It is characterized, in the ceca, by inflammation, thickening, occasional perforation of the walls and denudation of the epithelium; in the liver by enlargement and by the formation of cream-yellow spots.

Since the investigations of Theobald Smith, published in 1895, it has been commonly believed that the disease is due to an ameba, *Amœba meleagridis* Smith. The present writers believe they have demonstrated, however, that the disease is caused by a *Coccidium,* which, according to the nomenclature adopted, may be a variety of *Coccidium cuniculi,* and that *Amœba meleagridis* Smith is probably the schizont stage in the development of the *Coccidium.*

The stages of the *Coccidium* most commonly found were the schizonts and the macrogametes or oocytes. The former were first discovered in smears by means of a rose-analin-violet and methylene-blue stain. Later they were recognized in fresh preparations, both within and without the epithelial cells. The macrogametes were most common in the cecal and the intestinal content below the junction of the ceca, and were often present when the cyst stage was absent. Besides these stages the microgametocytes, the microgametes, the merozoites and the sporozoites were recognized both in fresh preparations and in sections stained with hematoxylin and eosin.

By placing the cecal content containing macrogametes in a solution of 10 per cent. potassium bichromate, the growth of bacteria was stopped and the development into cysts and then into sporozoites could be watched. The cysts are commonly oval, and have an average size of 21 by 14 micra. Cultures containing cysts were also made to develop in 2 per cent. formalin, saturated solution of thymol, 4 per cent. boracic acid, 1 per cent. lysol and 2 per cent. carbolic acid. The organism is common in the soil and is frequently found in apparently normal fowls, which do not appear to be so susceptible as turkeys to this form of the disease.

By means of feeding portions of cecal content or parts of ceca of diseased birds, the disease was produced experimentally in turkeys, chicks and sparrows, but not in guinea-pigs, kittens or in rabbits. In young turkeys the disease is almost certainly fatal; older birds may recover. It is doubtful if death is caused directly by the *Coccidium* in the majority of cases; whether there is a specific accompanying organism pathogenic to turkeys under these conditions, and less so to chickens, has not yet been determined. In cases of perforation of the cecum, death soon follows from acute peritonitis. No method of treatment is at present recognized.

The investigations reported above were made at the Rhode Island Agricultural Experiment Station, in cooperation with the Bureau of Animal Industry, U. S. Department of Agriculture, during the year 1906–7.

Leon J. Cole
Philip B. Hadley

[1] Abstract of paper read before the Zoologists' meeting at New Haven, December, 1907.

THE NATIONAL CONSERVATION COMMISSION

Pursuant to the recent Conference of Governors in the White House on the conservation of our natural resources, the President on June 8 appointed a National Conservation Commission, comprising Senators and Representatives in Congress, scientific and technical

experts, and citizens of the several sections of the country.

The instructions to the Commissioners are as follows:

THE WHITE HOUSE,
WASHINGTON, June 8, 1908.

The recent Conference of Governors in the White House confirmed and strengthened in the minds of our people the conviction that our natural resources are being consumed, wasted and destroyed at a rate which threatens them with exhaustion. It was demonstrated that the inevitable result of our present course toward these resources, if we should persist in following it, would ultimately be the impoverishment of our people. The Governors present adopted unanimously a Declaration reciting the necessity for a more careful conservation of the foundations of our national prosperity, and recommending a more effective cooperation to this end among the States and between the States and the Nation. A copy of this Declaration is enclosed.

One of the most useful among the many useful recommendations in the admirable Declaration of the Governors relates to the creation of State commissions on the conservation of resources, to cooperate with a Federal Commission. This action of the Governors can not be disregarded. It is obviously the duty of the Federal Government to accept this invitation to cooperate with the States in order to conserve the natural resources of our whole country. It is no less clearly the duty of the President to lay before the Federal Congress information as to the state of the Union in relation to the natural resources, and to recommend to their consideration such measures as he shall judge necessary and expedient. In order to make such recommendations the President must procure the necessary information. Accordingly, I have decided to appoint a Commission to inquire into and advise me as to the condition of our natural resources, and to cooperate with other bodies created for a similar purpose by the States.

The Inland Waterways Commission, appointed March 14, 1907, which suggested the Conference of Governors, was asked to consider the other natural resources related to our inland waterways, and it has done so. But the two subjects together have grown too large to be dealt with by the original body. The creation of a Commission on the Conservation of Natural Resources will thus promote the special work for which the Inland Waterways Commission was created, and for which it has just been continued and enlarged, by enabling it to concentrate on its principal task.

The Commission on the Conservation of Natural Resources will be organized in four sections to consider the four great classes of water resources, forest resources, resources of the land and mineral resources. I am asking the members of the Inland Waterways Commission to form the Section of Waters of the National Conservation Commission. In view of the lateness of the season and the difficulty of assembling the members of tne sections at this time, a Chairman and a Secretary for each Section have been designated, and the Chairman and Secretaries of the Sections will act as the Executive Committee, with a Chairman who will also be Chairman of the entire Commission. I earnestly hope that you will consent to act as a member of the Commission, in common with the following gentlemen:

Waters

Hon. Theodore E. Burton, Ohio, *Chairman.*
Senator William B. Allison, Iowa.
Senator Francis G. Newlands, Nevada.
Senator William Warner, Missouri.
Senator John H. Bankhead, Alabama.
Mr. W J McGee, Bureau of Soils, *Secretary.*
Mr. F. H. Newell, Reclamation Service.
Mr. Gifford Pinchot, Forest Service.
Mr. Herbert Knox Smith, Bureau of Corporations.
Hon. Joseph E. Ransdell, Louisiana.
Prof. George F. Swain, Institute of Technology, Mass.
The Chief of Engineers, U. S. Army.

Forests

Senator Reed Smoot, Utah, *Chairman.*
Senator Albert J. Beveridge, Indiana.
Senator Charles A. Culberson, Texas.
Hon. Charles F. Scott, Kansas.
Hon. Champ Clark, Missouri.
Mr. J. B. White, Missouri.
Prof. Henry S. Graves, Yale Forest School, Connecticut.
Mr. William Irvine, Wisconsin.
Ex-Governor Newton C. Blanchard, Louisiana.
Mr. Charles L. Pack, New Jersey.
Mr. Gustav Schwab, National Council of Commerce, New York.
Mr. Overton W. Price, Forest Service, *Secretary.*

Lands

Senator Knute Nelson, Minnesota, *Chairman.*
Senator Francis E. Warren, Wyoming.
Hon. John Sharp Williams, Mississippi.
Hon. Swager Sherley, Kentucky.
Hon. Herbert Parsons, New York.
Mr. James J. Hill, Minnesota.
Ex-Governor N. B. Broward, Florida.
Ex-Governor George C. Pardee, California.

Mr. Charles McDonald, American Society of Civil Engineers, New York.
Mr. Murdo Mackenzie, Colorado.
Mr. Frank C. Goudy, Colorado.
Mr. George W. Woodruff, *Secretary*.

Minerals

Hon. John Dalzell, Pennsylvania, *Chairman*.
Senator Joseph M. Dixon, Montana.
Senator Frank P. Flint, California.
Senator Lee S. Overman, North Carolina.
Hon. Philo Hall, South Dakota.
Hon. James L. Slayden, Texas.
Mr. Andrew Carnegie, New York.
Prof. Charles R. Van Hise, Wisconsin.
Mr. John Mitchell, Illinois.
Mr. John Hays Hammond, Massachusetts.
Dr. Irving Fisher, Yale University, Connecticut.
Mr. Joseph A. Holmes, Geological Survey, *Secretary*.

Executive Committee

Mr. Gifford Pinchot, *Chairman*.
Hon. Theodore E. Burton.
Senator Reed Smoot.
Senator Knute Nelson.
Hon. John Dalzell.
Mr. W J McGee.
Mr. Overton W. Price.
Mr. G. W. Woodruff.
Mr. Joseph A. Holmes.

One of the principal objects of the Federal Commission on the Conservation of Natural Resources will be to cooperate with corresponding commissions or other agencies appointed on behalf of the States, and it is hoped that the Governors and their appointees will join with the Federal Commission in working out and developing a plan whereby the needs of the Nation as a whole and of each State and Territory may be equitably met.

The work of the Commission should be conditioned upon keeping ever in mind the great fact that the life of the Nation depends absolutely on the material resources, which have already made the Nation great. Our object is to conserve the foundations of our prosperity. We intend to use these resources; but to so use them as to conserve them. No effort should be made to limit the wise and proper development and application of these resources; every effort should be made to prevent destruction, to reduce waste, and to distribute the enjoyment of our natural wealth in such a way as to promote the greatest good of the greatest number for the longest time.

The Commission must keep in mind the further fact that all the natural resources are so related that their use may be, and should be, coordinated. Thus, the development of water transportation, which requires less iron and less coal than rail transportation, will reduce the draft on mineral resources; the judicious development of forests will not only supply fuel and structural material, but increase the navigability of streams, and so promote water transportation; and the control of streams will reduce soil erosion, and permit American farms to increase in fertility and productiveness and so continue to feed the country and maintain a healthy and beneficial foreign commerce. The proper coordination of the use of our resources is a prime requisite for continued national prosperity.

The recent Conference of Governors, of the men who are the direct sponsors for the well-being of the States, was notable in many respects; in none more than in this, that the dignity, the autonomy, and yet the interdependence and mutual dependence of the several States were all emphasized and brought into clear relief, as rarely before in our history. There is no break between the interests of State and Nation, these interests are essentially one. Hearty cooperation between the State and the National agencies is essential to the permanent welfare of the people. You, on behalf of the Federal Government, will do your part to bring about this cooperation.

In order to make available to the National Conservation Commission all the information and assistance which it may desire from the Federal Departments, I shall issue an Executive order, directing them to give such help as the Commission may need.

The next session of Congress will end on March 4, 1909. Accordingly, I should be glad to have at least a preliminary report from the Commission not later than January 1 of next year.

Sincerely yours,
(Signed) Theodore Roosevelt

THE INLAND WATERWAYS COMMISSION

On June 5, 1908, the President reappointed the Inland Waterways Commission, with an increase in number and such extension of function as to authorize the correlation of the administrative Departments and Bureaus of the Federal Government in so far as their work is connected with waterways. The letter of appointment, addressed to the Chairman, Hon. Theodore E. Burton of Ohio, follows:

June 5, 1908.

The Inland Waterways Commission was appointed on March 14, 1907. It was appointed to meet the strongly expressed and reasonable demands of

the people. Commercial organizations throughout the Mississippi Valley and elsewhere demanded then and still demand such improvement of waterways and development of navigation as will prevent traffic congestion and develop commerce. It is an unpleasant fact that although the Federal Government has in the last half-century spent more than a third of a billion dollars in waterway improvement, and although the demand for transportation has steadily increased, navigation on our rivers has not only not increased, but has actually greatly diminished. The method hitherto pursued has been thoroughly ineffective; money has been spent freely for improving navigation, but river navigation at least has not been improved; and there is a just and reasonable demand on the part of the people for the improvement of navigation in our rivers in some way which will yield practical results. It was for such reasons as these that the Commission of which you are Chairman was requested to consider and recommend a general plan of waterway improvement giving reasonable promise of effectiveness.

The preliminary report of the Inland Waterways Commission was excellent in every way. It outlines a general plan of waterway improvement which when adopted will give assurance that the improvements will yield practical results in the way of increased navigation and water transportation. In every essential feature the plan recommended by the Commission is new. In the principle of coordinating all uses of the waters and treating each waterway system as a unit; in the principle of correlating water traffic with rail and other land traffic; in the principle of expert initiation of projects in accordance with commercial foresight and the needs of a growing country; and in the principle of cooperation between States and the Federal Government in the administration and use of waterways, etc.; the general plan proposed by the Commission is new, and at the same time sane and simple. The plan deserves unqualified support. I regret that it has not yet been adopted by Congress, but I am confident that ultimately it will be adopted.

Pending further opportunity for action by Congress, the work of the Commission should be continued with the view of still further perfecting the general plan by additional investigations and by ascertaining definitely and specifically why the methods hitherto pursued have failed. To this end I ask that the present members of the Waterways Commission continue their most commendable public service. I am asking three others to join them, namely: Senator William B. Allison, of Iowa; Hon. Joseph E. Ransdell, of Louisiana, a member of the Rivers and Harbors Committee of the House of Representatives and President of the National Rivers and Harbors Congress; and Professor George F. Swain, of the Massachusetts Institute of Technology, a recognized authority on water power. When a Chief of Engineers is appointed to succeed General Alexander Mackenzie, retired, I shall also designate him a member, in lieu of General Mackenzie, whose retirement relieves him of further duty on the Commission. The Commission will thus be increased from nine members to twelve.

In order to facilitate the work of the Commission, I shall shortly issue an Executive order along the lines suggested by your findings and recommendations, directing the Executive Departments to give the Commission access to their records and all necessary and practicable assistance in securing information for submission to the President and to Congress.

An indirect but useful result of the work of the Commission was the recent Conference of Governors on the Conservation of our Natural Resources, held in the White House May 13–15. I take great pleasure in repeating my public expression of indebtedness and my congratulations to the Commission for their signal public service in connection with this great Conference; it was an event which is likely to exert a profound and lasting influence on the development and history of our country.

Copies of this letter are being sent to each of the twelve members of the Inland Waterways Commission.

Sincerely yours,
(Signed) THEODORE ROOSEVELT

Hon. Theodore E. Burton, Chairman,
Inland Waterways Commission.

THE HANOVER MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

From the preliminary announcement of the special summer meeting of the American Association, to be held at Hanover, N. H., from June 29 to July 3, distributed with the issue of SCIENCE for May 29, we repeat the following details:

The first general session will be held in Dartmouth Hall at 8 P.M., on Monday, the twenty-ninth. The registration will be open

at the office of the permanent secretary at College Hall from 10 A.M. on that day.

The American Physical Society and the Geological Society of America meet on June 30 and on July 1 in affiliation with the corresponding sections of the association. On the evenings of these days there will be lectures on "The Spoliation of Niagara," and on "The American Bison."

On July 2 there will be an excursion to the Blue Mountain Forest Park, stocked with buffalo, moose and other game by the late Mr. Austin Corbin. Elaborate and interesting excursions, both preceding and following the meeting, have been arranged by the Section of Geology and Geography.

Professor Robert Fletcher is chairman and Professor H. H. Horn, secretary, of the local committee. The official headquarters and social rendezvous will be in College Hall. The hotel headquarters will be in Hanover Inn, and room accommodations will be provided in the dormitories, with meals in the large dining-room of College Hall.

Most of the railways have offered a rate of a fare and a third on the certificate plan.

SCIENTIFIC NOTES AND NEWS

COLONEL W. C. GORGAS, eminent for his work on yellow fever at Havana and as chief sanitary officer of the Isthmian Canal Zone, has been elected president of the American Medical Association.

AT the University of Maine, the degree of doctor of laws was conferred on Dr. A. A. Noyes, acting president of the Massachusetts Institute of Technology, and on M. C. Fernald, for forty years connected with the university, formerly as president, who retired this year from the professorship of philosophy. The degree of doctor of science was conferred on L. H. Merrill, professor of biological and agricultural chemistry and on J. N. Hart, professor of mathematics and astronomy and dean.

THE University of Liverpool has conferred its doctorate of science on Mr. Francis Darwin and Professor J. L. Todd, and its doctorate of engineering on the Hon. C. A. Parsons.

THE gold Karl Ritter medal of the Berlin Geographical Society has been conferred on Professor Hermann Wagner, of Göttingen.

PROFESSOR J. E. SINCLAIR, for the past thirty-nine years professor of mathematics at the Worcester Polytechnic Institute, has retired under the terms of the Carnegie Foundation.

DR. GEORGE I. ADAMS, formerly in the U. S. Geological Survey and lately with the Corps of Engineers of Mines of Peru, has been appointed geologist in the Bureau of Mines of the Philippine Islands and will sail from San Francisco on the *Mongolia* on June 30. His address will be Bureau of Mines, Manila, P. I.

DR. PÉROT has been appointed physicist in the Astrophysical Observatory at Meudon.

DR. ARTHUR BÖHM has been appointed chemist in the Geological Bureau at Berlin.

PROFESSORS BANG and Fibiger, of the University of Copenhagen, and Dr. Roerdam, a noted military surgeon, have been appointed delegates from Denmark to the tuberculosis congress to be held in Washington in September.

PROFESSOR CHARLES SCHUCHERT, curator of the geological collection in Peabody Museum, Yale University, started on May 30 on an exploring and collecting excursion for invertebrate fossils to Anticosti Island. Anticosti is an island 150 miles long by fifty miles wide, lying at the mouth of the St. Lawrence River, about twenty miles off the Labrador coast.

DR. GEORGE P. MERRILL, head of the department of geology of the United States National Museum, has returned from Meteor, Arizona, where he went several weeks ago for the Smithsonian Institution to make additional studies of a peculiar crater-form depression in the plain, about three quarters of a mile across and nearly six hundred feet deep. Dr. Merrill witnessed the boring of wells reaching a depth of 842 feet below the bottom of the depression. These and other studies have tended to confirm the conclusion, reached by him last year, that the crater was caused by a meteor.

DR. W. D. MATTHEW, of The American Museum of Natural History has left New York to join the expedition to western Nebraska under the direction of Mr. Albert Thomson. The main object of the party is to obtain complete skeletons of the three-toed horses of the Miocene epoch. While it is Dr. Matthew's intention to return to the museum about August 1, the other members of the party will remain in the field during the entire season.

THE American Museum of Natural History has sent Mr. Alanson Skinner to James Bay to make archeological and ethnological investigations among the Cree Indians. Dr. R. H. Lowie, of the anthropological department of the museum, who left New York City on May 5, has arrived at Fort Chippewyan on Lake Athabasca. Dr. Lowie plans to remain among the Athabascan Indians during the summer.

DR. L. COCKAYNE has been instructed by the New Zealand government to undertake botanical surveys in different parts of the dominion. He has completed a survey of a kauri forest (*Agathis australis*) in the north island, and also of the Tongariro National Park, and he is now engaged on a survey of another large forest. His reports will be published by the government as parliamentary papers.

THE memorial tablet in honor of Robert Henry Thurston, former director of Sibley College, Cornell University, who died in 1904, was unveiled on June 16. The tablet, which is a fine piece of work and bears a faithful likeness of the great engineering investigator and teacher, is the work of Herman MacNeil, a New York sculptor, who was formerly a student and instructor at Cornell. Professor R. C. Carpenter, one of Director Thurston's colleagues, presided. Addresses were delivered by President Schurman, Dr. Andrew D. White, Mr. John H. Barr, of Syracuse, and Director Albert W. Smith, of Sibley College. Mr. Henry Dubois presented the memorial on the part of the donors.

A MONUMENT in honor of Dr. Bernhardt Wartmann, the botanist, has been erected at St. Gallen.

DR. LUDWIG MOND has established a prize in honor of Professor Stanislao Cannizzaro, to be awarded by the Academy of Sciences at Rome.

DR. FERDINAND LÖWL, professor of geology at the University of Czernowitz, has died at the age of fifty-two years.

UNIVERSITY AND EDUCATIONAL NEWS

MR. HENRY PHIPPS, of Pittsburg and New York, has made a large gift to the Johns Hopkins University for the founding of a Psychiatric Clinic. It provides for the construction of a hospital building on the Hopkins Hospital grounds to accommodate sixty patients, together with apparatus, and laboratories for the scientific investigation of mental abnormalities by pathological, chemical, and psychological methods. Mr. Phipps will provide for the maintenance of a medical and nursing staff, including salaries for a professor of psychiatry and assistants and other expenses for a period of ten years. The total amount of the gift is withheld in accordance with the wishes of Mr. Phipps, but it is understood that it will considerably exceed half a million dollars.

THE corner stone of the Morley Chemical Laboratory was laid on the Adelbert College campus, June 11, when an address was delivered by the director, Olin Freeman Tower, Ph.D. The laboratory is to cost at least $120,000, and is expected to be ready for use in the fall of 1909.

DROWN MEMORIAL HALL, erected at Lehigh University, for the social purposes of the students, as a memorial to Thomas Messenger Drown, formerly president of the university and eminent as a chemist, was dedicated on June 9. Addresses were made by Dr. C. B. Dudley and by Dr. Rossiter W. Raymond.

THE corner stone of the new agricultural building of the University of Maine was laid in connection with the commencement exercises last week. President S. E. Fellows presided. Dr. W. H. Jordan, director of the New York Experiment Station, Geneva, made the opening address. Hon. Payson Smith, state superintendent of public schools, spoke briefly, and was followed by Dean W. D.

Hurd, of the university. The corner stone was then laid by Hon. Augustus W. Gilman, state commissioner of agriculture.

At the University of Nevada, the new mining building and the statue of John W. Mackay, both the gift of Mr. Clarence H. Mackay and his mother, Mrs. John W. Mackay, were dedicated on commencement day. The building, erected at a cost of $75,000, is to house the departments of mining and metallurgy and of geology and mineralogy, ample accommodation being provided for all the work of these departments, besides a large museum room which occupies one wing. In addition to this, Mr. Mackay has promised other gifts of money to the university, for a part of the equipment and running expenses of the same departments, for extensive improvements of the campus, and for providing an athletic field and training quarters.

Ground has been broken for the School of Mines Building of the University of Pittsburg as the University of Pennsylvania is hereafter to be called. This building, which will cost $175,000, is the first of the group to be erected for the University opposite the Carnegie Institute and the Carnegie Technical School.

The first commencement exercises of the Carnegie Technical Schools, Pittsburg, was held on June 17. Dr. R. S. Woodward, president of the Carnegie Institution of Washington, delivered the address to the graduating class, which numbered fifty-nine.

Dr. G. Stanley Hall, president of Clark University, gave the address at the commencement exercises of the College of Physicians and Surgeons, Boston.

Dr. Edwin E. Sparks, professor of American History at the University of Chicago, was on June 17 installed as president of the Pennsylvania State College, succeeding Dr. George W. Atherton, who died in 1906. Dr. Alex. C. Humphreys, president of Stevens Institute of Technology, and Dr. Paul Shorey, professor of Greek in the University of Chicago, made addresses.

At Western Reserve University, Carl Byron James has been made assistant professor of biology in Adelbert College and the College for Women, and Roger Griswold Perkins, M.D., associate professor of pathology and hygiene in the medical school. George Trumball Ladd, LL.D., has been appointed lecturer on education in the College for Women.

Professor A. H. Patterson, of the University of Georgia, has been elected professor of physics at the University of North Carolina.

Dr. Chas. E. Cory has been appointed head of the department of philosophy in the Washington University, in the place of Professor A. E. Lovejoy, who, as we have already announced, has accepted a call to the University of Missouri.

Central University, Danville, Ky., has elected Professor Frank Lewis Rainey to the chair of biology. Mr. Rainey, who is spending the summer in England and on the continent, has been at the head of the same department in Parsons College, Fairfield, Iowa, for the past five years.

In the chemical department of the University of Illinois appointments have been made as follows: *Instructors*—Grinnell Jones, Ph.D. Harvard, '08; B. S. Lacy, Ph.D. Harvard, '06; Brainard Mears, Ph.D. Johns Hopkins University, '08. *Research Assistant*—E. E. Gorsline, Ph.D. Johns Hopkins University, '08. *Assistant.*—James Coss, Upper Iowa University. *Graduate Assistants*—J. E. Egan, DePauw University; Luther Knight, formerly assistant at Rose Polytechnic Institute; E. K. Strachan, Worcester Polytechnic Institute; Guy Conrey, University of Michigan; W. F. Washburn, formerly assistant, University of Maine.

Mr. William Bateson, F.R.S., has been elected to the chair of biology at Cambridge University, which has been established for five years, largely owing to an anonymous donor. Mr. Bateson, who was born in 1861, is a son of the late master of St. John's College and has been a fellow of this college since 1885.

During the present summer the address of the responsible editor of Science is Woods Hole, Mass.

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